

AMENDMENTS TO THE SPECIFICATION

Page 1, second full paragraph, delete in its entirety, and replace with the following:

More ~~detailed specifically~~, the invention is related to a frequency allocation scheme for a set of optical channels (each at specific carrier frequency) multiplexed using wavelength-division multiplexing and polarization-division multiplexing.

Page 1, fourth paragraph, (spanning pages 1 and 2), delete in its entirety, and replace with the following:

Such a transmission scheme uses an optical transmitter connected to an optical receiver by the fiber link. The transmitter generally modulates the power of an optical carrier wave from a laser oscillator as a function of the information to be transmitted. NRZ or RZ modulation is very frequently used and entails varying the power of the carrier wave between two levels: a low level corresponding to extinction of the wave and a high level corresponding to a maximum optical power. The variations of level are triggered at times imposed by a clock rate and this defines successive time cells allocated to the binary data to be transmitted. By convention, the low and high levels respectively represent the binary values "0" and "1".

Page 2, second full paragraph, delete in its entirety, and replace with the following:

Not only does chromatic dispersion ~~limit~~ limit the possibility of transmission, but also it is a main factor for distortion. Increasing the data rate up to higher levels- ~~we are talking about T~~ Bit/s – the effects of the fibers increase the impact on the received signal. One solution is the use

AMENDMENT UNDER 37 C.F.R. § 1.111
U.S. APPLN. NO. 10/066,711

of DWDM (dense wavelength division multiplex) systems to increase the bit rate. The wavelength channels are selected in a way that the information of the single channels can be selected at the receiver side and analyzed with an acceptable bit/error rate. Again, the bit rate is limited by the spectrum of the channels.

Page 3, second full paragraph, delete in its entirety and replace with the following:

So a VSB filtering at the receiver side is proposed. With a modulation and filtering scheme like VSB, the bandwidth efficiency ~~increase~~ increases to a value of more than 0.6 bit/s/Hz compared with 0.4 bit/s/Hz in conventional systems.

Page 3, third full paragraph, delete in its entirety, and replace with the following:

Again the transmission is limited due to the effects of cross ~~talking~~talk between the adjacent channels.

Page 3, fourth full paragraph, delete in its entirety, and replace with the following:

The ~~inventional~~inventive solution comprises a VSB filtering scheme with alternating side band filtering and two sets of channels orthogonally polarized. The increase of bandwidth efficiency is important. The effects of cross ~~talking~~talk between adjacent channels are minimized.

Page 3, fifth full paragraph, delete in its entirety, and replace with the following:

Each of these channels is generated by passing light into a modulator. The resulting optical spectrum consists of a carrier and two optical sidebands apart the carrier. The lower-wavelength sideband is referred to next as "left side" and the higher-wavelength side-band is referred to as "right-side". When sent into the transmission system, such spectrum is passed into a cascade of optical components with a filtering transfer function, ~~be them such as~~ wavelength division multiplexers, wavelength division demultiplexers, specific filters, etc, whether located within the transmitter, or the receiver or in-line.

Page 4, before the second full paragraph, (between lines 10 and 11), insert and center:

DETAILED DESCRIPTION OF THE INVENTION

Page 4, second full paragraph, delete in its entirety, and replace with the following:

The spectrum of a NRZ signal is symmetric to the carrier frequency of the wavelength channels. In figure 1 a line marks the carrier. The left and the right ~~side~~sides of the signal contain the same information. In the overlapping areas marked by an arrow, the information of one channel can no longer be clearly distinguished from the adjacent channels information. ~~In a ease~~If the channel spacing decreases as in a DWDM (dense wavelength division multiplex), the overlapping areas increase.

Page 4, third full paragraph, delete in its entirety, and replace with the following:

Figure 2 shows a channel distribution which is not equidistant. The first two channels CH 1 and CH 2 are ~~divided~~separated by a space A. The ~~space between~~distance to the next channel CH3 is then space B. Then, pairs of channels are transmitted separated by a larger space than ~~that~~ in the space between the channels of each pair. Now, the filtering function F filters the left side ~~for of~~ channel CH1 and the right side of Channel CH2. Again CH3 is left side filtered and CH4 ~~on the~~is right side filtered. The bandwidth can be used in an optimal way.

Page 4, fourth full paragraph, (spanning pages 4 and 5), delete in its entirety, and replace with the following:

One embodiment of the invention is shown in Figure 3. The transmitter function is realised with lasers 1 ~~with and~~ modulators 2. If not initially linearly polarized, the laser and modulators are connected first to polarizers and ~~than then~~ to a wavelength multiplexer 3. The multiplexer is tapped to the transmission line 4. The receiver function is realised with ~~one polarisation~~ one polarisation demultiplexer 11: followed by a wavelength demultiplexer 5 connected to the transmission line 4 and filters 6. Another configuration is to use a wavelength demultiplexer 5 followed by several polarization demultiplexers 11 before the filters 6. The filters are attached to receivers 7.

Page 5, first full paragraph, delete in its entirety, and replace with the following:

The laser 1 sends a first wavelength channel. A modulator 2 modulates this channel. The first channel CH1 is linearly polarized. The second channel CH2 is polarised orthogonal to the first channel and so on. The signal is multiplexed together with the other channels in the multiplexer 3. The multiplexed signals are transmitted over the transmission line 4 to the polarisation demultiplexer 11. The two orthogonal polarizations are separated and fed into the wavelength demultiplexer 5. Here the DWDM signal is demultiplexed in the different wavelength channels. The first wavelength channel CH1 is then filtered by left-side filtering, and the second channel which was orthogonally polarised is also ~~filters~~ filtered by a left side filtering and so on. The next two channels are right side filtered.

Page 5, second full paragraph, delete in its entirety, and replace with the following:

The performance of the solution to interleave two sets of equally spaced-odd and even channels with orthogonal polarisations and ~~demultiplex-demultiplexed~~ with a tracking polariser at the receiver end was demonstrated in a 6.4 Tbit/s (160x40 Gbit/s) transmission experiment over 186km distance.

Page 6, first full paragraph, delete in its entirety, and replace with the following:

The BER performance of CH1 is shown in shown in Fig. 5 as a function of tuned test channel wavelength CH2, detuned by $\delta \approx -0.1$ nm off the carrier of the signal wavelength. When the signal wavelength matches the test wavelength, the performance is $5 \cdot 10^{-11}$. This performance is already ~~in a~~ significant improvement with respect to the configuration where Polarisation Division Multiplex is obtained from an identical laser for the test and signal channels, as explained by a reduced coherence. But remarkably, BER drops to $5 \cdot 10^{-13}$ when the channel test wavelength is offset from the carrier towards the unfiltered signal side band. On the other hand, offsetting the channel test wavelength towards the filter central frequency naturally enhanced the cross-talk with between test and signal (as illustrated by strong variations of the BER with time, a signature of PDM crosstalk), the lowest performance being obtained when $\delta \approx -0.1$ nm. In other words, the introduction of PDM has the most detrimental impact when the carrier of the orthogonal channel CH2 coincides with the centre of the signal filter.

Page 6, sixth paragraph (spanning pages 6 and 7), delete in its entirety, and replace with the following:

~~The two solutions are have similar performance-performances~~ (deduced by 90° rotation). Channels along the same polarisation are alternatively spaced by A GHz and B GHz assuming $A < B$ without loss of generality. Given a channel plan with (A,B), the channel plan along the other polarisation should follow the same (A,B) requirement, but shifted with respect to the other either towards higher wavelengths **or** lower wavelengths by:

$$\frac{A}{2} + \delta_{\text{filter}}, \pm 20\%$$

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δ_{filter} being the frequency shift (from the filter centre to the carrier) for optimal VSB filtering. In the case ~~were~~ where δ_{filter} is not identical when left-side and right-side filtering are implemented, an average δ_{filter} should be used.

AMENDMENT UNDER 37 C.F.R. § 1.111
U.S. APPLN. NO. 10/066,711

Please delete the present Abstract of the Disclosure and replace it with the following new Abstract of the Disclosure.

Summary

The invention shows a A frequency allocation scheme for optical channels transmitted via a WDM transmission line with alternating left side and right side filtering for adjacent channels, with alternating channel spacing of A and B, where $A < B$, and with two sets of channels orthogonally polarized.

(Figure 3)